

THE INSECT FAUNA OF NINEBARK,
PHYSOCARPUS OPULIFOLIUS (ROSACEAE)

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Abstract.—The insect fauna of ninebark, *Physocarpus opulifolius* (L.) Maxim., a primitive rosaceous shrub, was studied in New York and Pennsylvania during 1978–84. Notes on phenology and habits and published records from *Physocarpus* are given for the specialist herbivores, for species that are potential specialists pending collection of additional data, and for those that appear to include ninebark as a preferred host. The specialists discussed are the mirids *Plagiognathus punctatipes* Knight and *Psallus physocarpi* Henry, the aphids *Utamphorophora humboldti* Essig and *Aphis neilliae* Oestlund, the chrysomelid *Calligrapha spiraeae* (Say), the geometrids *Eulithis molliculata* (Walker) and *Itame abruptata* (Walker), the tortricid *Ancylis spiraeifolia* (Clemens), and the torymids *Megastigmus gahani* Milliron and *M. physocarpi* Crosby. Listed in tabular form are phytophagous insects associated with ninebark, including a separate list of species that visited inflorescences for nectar or pollen; predators and any associated prey species; and parasites reared from the plant and their hosts, if known.

We became interested in the insect fauna of ninebark, *Physocarpus opulifolius* (L.) Maxim., in 1977 when our attention was called to an outbreak of the chrysomelid *Calligrapha spiraeae* (Say) in an ornamental planting of this rosaceous shrub. In studying the life history of *C. spiraeae* (Wheeler and Hoebeke, 1979) we realized that ninebark, a primitive member of the Rosaceae, harbored a diverse insect fauna that included several host-specific, poorly known species. McGuffin (1977) mentioned ninebark as a plant neglected in surveys of Lepidoptera and as the apparent sole host of two geometrids, *Eulithis molliculata* (Walker) and *Itame abruptata* (Walker). Several other insects have been recorded from the plant, including two species that may cause significant injury. At Oak Park, Illinois, in 1909, *Aphis neilliae* Oestlund “became so abundant that the leaves were badly curled and the shoots stunted or even killed” (Davis, 1910). The buprestid *Dicerca pugionata* (Germar) develops in living stems of ninebark and may kill its host (Knull, 1925). We report here the results of a qualitative survey of ninebark insects conducted in New York and Pennsylvania during 1978–84.

THE HOST PLANT

Physocarpus opulifolius originally was placed in the genus *Spiraea*; hence, the epithet *spiraeae* applied by Say (1826) in describing a new species of *Calligrapha* associated with ninebark. The plant's common name is derived either from its

bark, which peels off in numerous layers (Strausbaugh and Core, 1978), or from the medicinal cures the plant once was thought to produce (Stokes, 1981).

P. opulifolius is a member of the subfamily Spiraeoideae of the Rosaceae, a family belonging to the relatively primitive order Rosales. It is one of 10 species of a mainly North American genus of hardy deciduous shrubs (one Asian species is known). Often found along stream and river banks and in sandy soil at the edge of woods, it ranges from Quebec west to Michigan and south to Tennessee. In its several cultivars, ninebark is planted occasionally as an ornamental, and its movement in horticultural trade and escape from cultivation have broadened the native range. Ninebark is characterized by the exfoliating bark; alternate, toothed, usually 3-lobed leaves that resemble those of currants (*Ribes*) or those of *Viburnum opulus* L.; and white or pinkish flowers, having 5 petals and sepals and 20–40 stamens, which are borne in umbel-like clusters up to 5 cm wide. Pollination is unspecialized and is effected by a variety of insects that cannot avoid contacting the prominent anthers. The fruit is a small, firm-walled, inflated follicle, an attribute responsible for the generic name *Physocarpus*, derived from the Greek *physa* (bladder) and *karpos* (fruit). The seeds are smooth, roundish, and have a shining testa. This characterization of ninebark was drawn from Gleason and Cronquist (1963), Takhtajan (1969), Bailey and Bailey (1976), Stokes (1981), and Everett (1981).

STUDY SITES AND METHODS

In New York, collections of insects from ninebark were made during 1979–83 at irregular intervals from an extensive planting near Salmon Creek at Ludlowville, Tompkins Co. Additional collections and observations were made from a native stand growing in Taughannock Falls State Park about 13 km north of Ithaca (Tompkins Co.) and from a few ornamental plants on and near the Cornell University campus at Ithaca.

The main study site in Pennsylvania was a native stand growing along a creek near Route 443 about 15 km northeast of Harrisburg, Dauphin Co. In 1979 and 1980 this planting was surveyed for insects once or twice each week during April, weekly during May–June (except for a 10-day interval each season), and every 2–3 weeks during July and August. Late-season collections were made from late September to early November 1978; additional sampling was conducted at irregular intervals during 1981–84. On each sample date insects first were observed on the plants, and the species present and any feeding or host injury were recorded. Then branches were tapped over a small tray (24 × 30 cm) and the dislodged species noted or collected for identification. Notes on the relative abundance and stages present were recorded for some of the most common insects; notes on plant phenology also were made. Immature insects that could not be identified in the field were reared to maturity in the laboratory on sprigs of the host. Parasitized insects observed in the field were held for parasite emergence and subsequent identification. Seeds collected in early November 1978 were held for the emergence of seed predators. Additional collections of ninebark insects were made from native stands in 12 counties.

RESULTS AND DISCUSSION

The phytophagous insects that develop on ninebark or feed as adults on foliage and stems are listed in Table 1; species of apparent accidental occurrence have

Table 1. Phytophagous insects (excluding inflorescence feeders) associated with *Physocarpus opulifolius* in New York and Pennsylvania.

Species	Stages Collected ^a	Plant Part Affected ^b	No. of Collections	
			NY	PA
Orthoptera				
Acrididae				
Unidentified sp.	N	F, Lv	— ^c	2
Tettigoniidae				
<i>Amblycorypha rotundifolia</i> (Scudder)	A	Lv	1	—
Unidentified spp.	N	Lv	1	4
Gryllidae				
<i>Oecanthus</i> sp.	N	Lv, S	1	—
Thysanoptera				
Thripidae				
<i>Thrips</i> sp.	L, A	F	—	1
Hemiptera-Heteroptera				
Miridae				
<i>Heterocordylus malinus</i> Slingerland	N, A	F, Lv	—	2
<i>Lopidea heidemanni</i> Knight	N, A	Lv	—	3
<i>L. media</i> (Say)	N, A	F, Lv	—	8
<i>Neurocolpus nubilus</i> (Say)	N, A	F	1	9
<i>Phytocoris salicis</i> Knight	N, A	Lv	—	2
<i>Plagiognathus punctatipes</i> Knight	N, A	F	8	38
<i>Poecilopsus lineatus</i> (F.)	E, N	Lv	—	2
<i>Psallus physocarpus</i> Henry	N, A	F	4	22
<i>Taedia scruposa</i> (Say)	N, A	F	2	5
Pentatomidae				
<i>Acrosternum hilare</i> (Say)	E, N, A	F	5	8
<i>Euschistus servus</i> euschistoides (Vollenhoven)	N	F	1	—
<i>E. tristigmus tristigmus</i> (Say)	N, A	F	2	10
Coreidae				
<i>Acanthocephala terminalis</i> (Dallas)	N, A	Lv	—	1
Hemiptera-Homoptera				
Membracidae				
<i>Spissistilus borealis</i> Fairmaire	A	Lv?	1	—
<i>Stictocephala taurina</i> (Fitch)	A	Lv?	1	—
Unidentified sp.	E	?	1	4
Cicadellidae				
<i>Empoasca</i> sp.	N	Lv	—	9
<i>Erythroneura bitincta</i> McAtee	A	Lv	—	1
<i>E. bistrata</i> var. <i>stricta</i> McAtee	A	Lv	1	—
<i>Erythroneura</i> sp., near <i>usitata</i> Beamer	A	Lv	—	1

Table 1. Continued.

Species	Stages Collected*	Plant Part Affected*	No. of Collections	
			NY	PA
<i>Erythroneura</i> sp.	N	Lv	—	5
<i>Graphocephala coccinea</i> (Forster)	N, A	Lv	4	7
<i>Jikradia olitoria</i> (Say)	N	Lv	—	4
<i>Penthimia americana</i> Fitch	N, A	Lv	2	10
<i>Typhlocyba</i> sp.	A	Lv	1	—
Cercopidae				
<i>Clastoptera obtusa</i> (Say)	A	Lv	—	2
<i>Lepyronia quadrangularis</i> (Say)	N, A	Lv	1	3
Flatidae				
<i>Anormenis septentrionalis</i> (Spinola)	N, A	Lv	—	3
<i>Metcalfa pruinosa</i> (Say)	N, A	Lv	5	4
Acanaloniidae				
<i>Acanalonia conica</i> (Say)	N, A	Lv	2	1
Aphididae				
<i>Aphis neilliae</i> Oestlund	N, A	Lv	—	9
<i>Nearctaphis bakeri</i> (Cowan)	N	F	—	2
<i>Utamphorophora humboldti</i> Essig	E, N, A	Lv	4	27
Coleoptera				
Scarabaeidae				
<i>Dichelonyx diluta</i> Fall	A	Lv	2	—
<i>Macroductylus subspinosus</i> (F.)	A	F	—	1
<i>Popillia japonica</i> Newman	A	Lv	1	3
Buprestidae				
<i>Dicerca pugionata</i> (Germar)	A	Lv	—	2
Chrysomelidae				
<i>Calligrapha spiraeae</i> (Say)	E, L, P, A	Lv	1	40
<i>Diabrotica undecimpunctata howardi</i> Barber	A	Lv	—	6
<i>Nodonota margaretae</i> Schultz	A	Lv	—	4
<i>N. puncticollis</i> (Say)	A	Lv	—	7
<i>Odontota dorsalis</i> Thunberg	A	Lv	—	2
<i>Paria fragariae</i> Wilcox	A	Lv	1	4
<i>P. quadrinotata</i> (Say)	A	Lv	—	2
Lepidoptera				
Notodontidae				
<i>Schizura unicornis</i> (J. E. Smith)	L	Lv	1	1
Noctuidae				
<i>Eupsilia morrisoni</i> (Grote)	L	Lv	—	3
<i>Eupsilia</i> sp.	L	Lv	4	—
<i>Lithophane oriunda</i> Grote	L	Lv	1	—
<i>Lithophane</i> sp., near <i>hemina</i> Grote	L	Lv	—	1
<i>Melanchra adjuncta</i> (Guenée)	L	Lv	—	2

Table 1. Continued.

Species	Stages Collected ^a	Plant Part Affected ^b	No. of Collections	
			NY	PA
<i>Morrisonia evicta</i> (Grote)	E, L	Lv	—	2
<i>Orthosia hibisci</i> (Guenée)	L	Lv	2	5
<i>Zylena curvamacula</i> (Morrison)	L	Lv	1	—
Lymantriidae				
<i>Lymantria dispar</i> (L.)	L	F	—	1
Thyatiridae				
<i>Habrosyne gloriosa</i> (Guenée)	L	Lv	3	8
Geometridae				
<i>Erannis titharia</i> (Harris)	L	Lv	—	3
<i>Eulithis molliculata</i> (Walker)	L	Lv	7	7
<i>Eupithecia miserulata</i> Grote	L	Lv	—	1
<i>Hypagyrtis unipunctata</i> (Haworth)	L	Lv	1	—
<i>Itame abruptata</i> (Walker)	L	Lv	6	11
<i>Lomographa semiclarata</i> (Walker)	E, L	Lv	—	11
<i>L. vestaliata</i> (Guenée)	L	Lv	2	—
<i>Phygadeuon titea</i> (Cramer)	L	F, Lv	1	1
<i>Prochoerodes transversata</i> (Drury)	L	Lv	1	—
Pyralidae				
<i>Herpetogramma abdominalis</i> (Zeller)	L	Lv	1	—
Tortricidae				
<i>Ancylis spraeifolia</i> (Clemens)	L, P, A	Lv	5	13
<i>Choristoneura rosaceana</i> (Harris)	L, A	Lv	4	—
<i>Olethreutes permundana</i> (Clemens) ^d	L, A	F, Lv	11	25
Cochylidae				
<i>Aethes</i> sp.	L, (A?)	S	1	10+
Diptera				
Cecidomyiidae				
<i>Contarinia</i> sp. 1	L	Lv	—	5+
<i>C.</i> sp. 2	L	Lv	—	5+
<i>C.</i> sp. 3	L	F	—	10+
Hymenoptera				
Torymidae				
<i>Megastigmus gahani</i> Milliron	L, A	S	3	10
<i>M. physocarp</i> Crosby	A	S	1	—

^a Stages collected: E, eggs; L, larvae; P, pupae; A, adults.^b Plant part affected: F, flowers/fruit; Lv, leaves/stems; S, seeds.^c — = not collected.^d Including an unidentified species of *Olethreutes*.

been omitted. Insects collected from the inflorescences where they appeared to feed on nectar or pollen are recorded in Table 2. Through the courtesy of Frank D. Fee (State College, PA), this list of flower visitors includes his extensive records of Diptera taken from ninebark inflorescences in Pennsylvania during 1978–81. Notes on seasonal history and habits are given for the ninebark specialists and for those herbivores that may prove specific to *Physocarpus opulifolius*, or to include this plant among their preferred hosts when additional information is obtained. The phenological data apply to populations observed near Harrisburg, PA unless stated otherwise; early-season development of plant and insect populations in New York generally was 1–2 weeks behind.

Hemiptera-Heteroptera.—*Plagiognathus punctatipes* Knight first was associated with ninebark in a list of Miridae from West Virginia (Wheeler et al., 1983). Knight (1923) described this phyline mirid mainly from a series (18 specimens) he collected at Ithaca, New York, “on flowers of an ornamental shrub”; with little doubt the plant was *Physocarpus opulifolius*.

Overwintered eggs of *P. punctatipes* began to hatch during the first week of May when flower buds were evident but tightly closed. Third- and fourth-instar nymphs were observed by the third week of May when white was becoming visible in the closed buds. The population consisted of fifth instars during early bloom (late May). The first appearance of adults coincided with full bloom, usually the first week of June; they were most numerous in mid-June when petals were beginning to fall. Each season at this time some adults dispersed to the inflorescences of nearby staghorn sumac, *Rhus typhina* L., at the main sample site. In most years, adults of this univoltine mirid were not observed on ninebark (or sumac) after late June or early July.

*Psallus physocarp*i Henry, a second mirid specializing on ninebark inflorescences, was described from specimens collected at the main study areas in New York and Pennsylvania (Henry, 1981). The habits of this univoltine phyline are similar to those of *Plagiognathus punctatipes*, but its populations develop 2–3 weeks later. Overwintered eggs began to hatch in late May, third instars were present by the first week of June, and the first adults were taken in collections of late June. Adults, which also dispersed to inflorescences of staghorn sumac, were abundant during the first week of July, and usually by mid-July only 1 or 2 were observed in the weekly samples. Adults were found in early August at higher elevations in western Pennsylvania.

Hemiptera-Homoptera.—In Pennsylvania, the cicadellid *Penthimia americana* Fitch was taken consistently on ninebark beginning with early-instar nymphs in late April. Third and fourth instars were collected in early to mid-May and fifth instars during mid- to late May. The host plants of this cercopid-like leafhopper (subfamily Gyponinae) have not been recorded. DeLong (1948) noted that it “seems to be associated with shrubs in wooded or cut-over areas”; Beirne (1956) stated that the hosts are “probably some woody plants.”

Essig (1941) described the aphid *Utamphorophora humboldti* from *Viburnum ellipticum* Hook. in California but, as noted by Hille Ris Lambers (1966), Essig later “suspected that the aphids did not live on viburnum.” Because Hille Ris Lambers collected this aphid on *Physocarpus* in California, it seems possible that Essig’s “viburnum” was a species of ninebark. The secondary hosts are various

Table 2. Insects associated with inflorescences of *Physocarpus opulifolius* in New York and Pennsylvania.

Hemiptera-Heteroptera	Stratiomyidae
Miridae	<i>Stratiomys adelpha</i> Steyskal
<i>Metriorrhynchomiris dislocatus</i> (Say)	Tabanidae
<i>M. fallax</i> Reuter	<i>Chrysops cincticornis</i> Walker, ^a ♂
Coleoptera	<i>C. sackeni</i> Hine, ^a ♂
Staphylinidae	Phoridae
<i>Acrotona</i> sp.	<i>Conicera dauci</i> (Meigen)
<i>Eusphalerum</i> sp.	<i>Megaselia</i> sp.
Helodidae	Syrphidae
<i>Cyphon variabilis</i> (Thunberg)	<i>Blera analis</i> (Macquart) ^a
<i>Scirtes orbiculatus</i> (F.)	<i>B. umbratilis</i> (Williston) ^a
Elateridae	<i>Brachyopa flavescens</i> Shannon ^a
<i>Agriotes oblongicollis</i> (Melsheimer)	<i>B. notata</i> Osten Sacken ^a
Cantharidae	<i>B. perplexa</i> Curran ^a
<i>Chauliognathus marginatus</i> F.	<i>B. vacua</i> Osten Sacken ^a
Dermestidae	<i>Cheilosia capillata</i> Loew ^a
<i>Anthrenus fuscus</i> Olivier	<i>C. comosa</i> Loew ^a
Nitidulidae	<i>C. cynoprosopa</i> Hull and Fluke ^a
<i>Carpophilus brachypterus</i> (Say)	<i>C. leucoparea</i> Loew ^a
Melandryidae	<i>C. orillaensis</i> Curran ^a
<i>Anaspis rufa</i> Say	<i>C. rita</i> Curran ^a
Mordellidae	<i>C. n. sp.</i> ^a
<i>Mordella marginata</i> Melsheimer	<i>Chrysogaster nigripes</i> Loew ^a
Cerambycidae	<i>C. sp.</i> ^a
<i>Analeptura lineola</i> (Say)	<i>Chrysotoxum pubescens</i> Loew ^a
<i>Brachyleptura circumdata</i> (Olivier)	<i>C. radiosum</i> Shannon ^a
<i>Clytus ruficola</i> (Olivier)	<i>Copestylum vesicularium</i> (Curran) ^a
<i>Melorchus bimaculatus</i> Say	<i>Epistrophe xanthostoma</i> (Williston) ^a
<i>Psenocerus supernotatus</i> (Say)	<i>Eristalis arbustorum</i> (L.) ^b
<i>Trachysida mutabilis</i> (Newman)	<i>E. anthophorina</i> (Fallen) ^a
Curculionidae	<i>E. saxorum</i> Wiedemann ^a
<i>Centranaspis picumnus</i> (Herbst)	<i>E. tenax</i> (L.) ^a
Lepidoptera	<i>E. transversus</i> Wiedemann ^b
Adelidae	<i>Hiatomyia cyanesces</i> Loew ^a
<i>Adela ridingsella</i> Clemens	<i>Lejops chrysostomus</i> (Wiedemann) ^a
Nymphalidae	<i>L. lineatus</i> (F.) ^a
<i>Phyciodes tharos</i> (Drury)	<i>Mallota bautias</i> (Walker) ^a
Diptera	<i>M. posticata</i> (F.) ^{a,b}
Tipulidae	<i>Metasyrphus pomus</i> (Curran) ^a
<i>Limonia canadensis</i> (Westwood)	<i>Myolepta nigra</i> Loew ^a
Chironomidae	<i>M. varipes</i> Loew ^a
Orthoclaadiinae	<i>Orthonevra</i> sp. ^a
Bibionidae	<i>Parhelophilus laetus</i> Loew ^a
<i>Dilophus</i> sp.	<i>Platycheirus</i> n. sp. ^a
Scatopsidae	<i>Somula decora</i> Macquart ^a
<i>Anapausis</i> n. sp.	<i>Sphaerophoria contigua</i> Macquart ^b
	<i>Sphecomyia vittata</i> (Wiedemann) ^a
	<i>Sphegina brachygaster</i> Hull ^a
	<i>S. campanulata</i> Robertson ^a
	<i>S. flavimana</i> Malloch ^{a,b}
	<i>S. lobata</i> Loew ^a
	<i>S. lobulifera</i> Malloch ^a

Table 2. Continued.

<i>Spilomyia alcinus</i> (Walker) ^a	<i>Gymnocyttia occidentalis</i> (Walker)
<i>Syritta pipiens</i> (L.) ^a	<i>Gymnosoma fuliginosum</i> Robineau-Desvoidy
<i>Temnostoma alternans</i> Loew ^a	<i>Hyalomyodes triangulifer</i> (Loew)
<i>T. barberi</i> Shannon ^a	
<i>Toxomerus geminatus</i> (Say) ^b	Hymenoptera
<i>Tropidia quadrata</i> (Say) ^a	Eucoilidae
<i>Xylota quadrimaculata</i> Loew ^a	<i>Kleidostoma</i> sp.
Sepsidae	Formicidae
Unidentified sp.	<i>Camponotus nearcticus</i> Emery
Ephydriidae	<i>Formica schaufussi</i> Mayr
<i>Ditrichophora exigua</i> Cresson	<i>F. subsericea</i> Say
Chloropidae	<i>Lasius alienus</i> (Foerster)
<i>Chlorops certimus</i> Adams	<i>L. neoniger</i> Emery
<i>C. obscuricornis</i> Loew	
<i>Malloewia nigripalpis</i> (Malloch)	Halictidae
<i>Ocella trigramma</i> (Loew)	<i>Dialictus cressonii</i> (Robertson)
<i>Rhopalopterum luteiceps</i> (Sabrosky)	<i>D. imitatus</i> (Smith)
<i>Tricimba melancholica</i> (Becker)	<i>Sphecodes ? cressonii</i> Robertson
Anthomyiidae	Andrenidae
<i>Hydrophoria</i> sp.	<i>Andrena ceanothi</i> Viereck
<i>Hylemya</i> sp.	<i>A. crataegi</i> Robertson
Muscidae	<i>A. hippotes</i> Robertson
<i>Graphomya maculata</i> (Scopoli)	<i>A. nivalis</i> Smith
Calliphoridae	<i>A. perplexa</i> Smith
<i>Lucilia illustris</i> (Meigen)	<i>A. wilkella</i> Kirby
<i>Pollenia rudis</i> (F.)	Anthophoridae
Tachinidae	<i>Ceratina dupla</i> Say or <i>calcarata</i> Robertson
<i>Allophorella</i> sp.	<i>Nomada lepida</i> Cresson
<i>Archytas instabilis</i> Curran	Apidae
<i>Epalpus signifer</i> (Walker)	<i>Apis mellifera</i> L.

^a Tabanidae and Syrphidae from records of F. D. Fee.

^b Syrphidae from present study.

grasses. *Myzus physocarpus* Pepper, described from *P. opulifolius* in Pennsylvania, is a junior synonym of *U. humboldti* (Cook, 1984).

Eggs of this early-season colonizer of ninebark overwintered under bud scales or on stems just beneath leaf buds. The hatching of eggs coincided with the first flush of leaves. Newly hatched fundatrices were observed during the second week of April in 1980; the third week, in 1979. Aphids fed between veins on lower leaf surfaces, their colonies usually most abundant at shoot apices. Infested leaves appeared crinkled and distorted, and sometimes smaller than uninfested leaves. Alate aphids began to appear during mid-May after which populations soon declined. Aphids generally were not observed on the plants after late May or early June, when presumably they colonized a secondary host plant. In 1978, the only year in which late-season collections were made, alates returned to ninebark in mid-October; alatae and apterae were common in early November.

Aphis neilliae Oestlund, known from *Physocarpus opulifolius* in Pennsylvania (Pepper, 1965) and New York (Leonard, 1968), was another early-season colonizer, appearing on the plants by mid- to late April. This aphid formed dense

colonies on new growth, typically on only a few plants or on several terminals of a single plant. Ants, *Lasius alienus* (Foerster) and *Tapinoma sessile* (Say), were present in most colonies. *Aphis neilliae* was not observed on ninebark after early or mid-May.

Coleoptera.—The chrysomelid *Calligrapha spiraeae* (Say), a specialist herbivore on ninebark, was the only coleopteran found to reproduce on the plant. A summary of its life history during 1977–78 (Wheeler and Hoebeke, 1979) and additional information obtained in 1979–84 are presented here.

Overwintered adults appeared on ninebark at leaf flush or shortly after (mid-April); they soon mated and deposited eggs, usually in small clusters (average of 5.9, $n = 21$), on the underside of leaves or on tips of dead twigs. A few first-instar larvae were observed in late May, but they did not become numerous until early to mid-June. Early-instar larvae chewed roundish holes in the interior of host foliage, whereas late instars fed on the edges of leaves, imparting a ragged appearance to the plants. Mature larvae dropped from ninebark and pupated in the soil beginning in mid-June, and adults of the first generation began to emerge in late June. A smaller second generation was produced during late July and August. In central Pennsylvania in 1977, larvae of the first generation defoliated an ornamental hedge (70 meters long). This chrysomelid was absent from the study sites in New York, and the only New York record is a single adult collected from ninebark at Aurora in June 1978 (Wheeler and Hoebeke, 1979).

Lepidoptera.—In New York and Pennsylvania, larvae of the thyatirid *Habrosyne gloriosa* (Guenée) were common on ninebark during late June through August. Although the larva was known to Forbes (1923), apparently no host plants have been recorded for this species.

Two geometrids known only from ninebark, *Eulithis molliculata* and *Itame abruptata* (McGuffin, 1977), were taken in our survey. As McGuffin noted, overwintering occurs in the egg stage, with egg hatch occurring in spring. McGuffin (1971) described the twig-mimicking larva of *E. molliculata* and (1972) the larva of *I. abruptata*. In Pennsylvania, early-instar larvae of these univoltine species usually appeared in the late April or early May samples, and mature larvae were collected during mid- to late May. In New York, a mid-July peak emergence of *E. molliculata* was indicated by blacklight collections made at the Ludlowville study site (J. E. Rawlins, pers. comm.). In New York, *E. molliculata* was collected more frequently than *I. abruptata*. A collection of the latter species at Taughannock Falls State Park in 1979 was a new state record (Hoebeke, 1980).

Another geometrid known from ninebark, *Lomographa semiclarata* (Walker) (McGuffin, 1981), was common in Pennsylvania. Eggs laid on upper leaf surfaces in mid- to late April hatched in late April or early May. Early-instar larvae collected in June probably represented a second generation.

The olethreutine tortricids *Olethreutes* sp., *O. permundana* (Clemens), and *Ancylis spiraeifolia* (Clemens) were among the most common ninebark herbivores and were encountered in nearly all plant colonies sampled in New York and Pennsylvania. The following observations refer to *O. permundana*, a species known from *Physocarpus* (Forbes, 1923), and possibly also to an unidentified species of *Olethreutes*. Larvae were observed on ninebark at or just before bud break (mid-April). First-instar larvae bored into tightly closed leaf buds and tied expanding leaves. Larvae became numerous in early May, and mature larvae were

collected by mid-May. First instars observed in late May and early June probably represented the beginning of a second brood; they often bored into flower buds. Larvae were present in samples until late June.

Ancyli spiraeifolia was described from *Physocarpus opulifolius* (Clemens, 1861) and is also known from spirea (MacKay, 1959). Clemens noted that larvae fold leaves longitudinally and live on parenchyma within the fold. In 1982 we observed adults on ninebark in two plantings during late May; in 1979 first-instar larvae already were present by late May, although they were not found on host plants until early June in 1980. A pupa of the first generation was observed in early July (and mid-July in New York). The number of generations was not determined, but larvae were recorded in samples from July to early November.

A seed predator tentatively identified as a cochylid, *Aethes* sp., was common on ninebark in Pennsylvania but was rarely collected in New York. Larvae were not reared to the adult stage, but the moths that appeared on *Physocarpus* each season from late May to early June were believed to represent this species. First-instar larvae were dissected from developing seeds in mid-June, and late-stage larvae were found in seeds collected in late September. In early November, apparently mature larvae were observed in seeds that still remained on the plants. We believe this univoltine species overwinters as a larva (or perhaps pupa) in fallen seeds.

Diptera.—At least three types of cecidomyiid galls were observed on ninebark in Pennsylvania. Larvae from these galls belong to the genus *Contarinia* and, although generally similar, they are thought to represent distinct species (R. J. Gagné, in litt.). No adults were collected, but rearing would allow us to determine whether distinct species induce the gall types described below.

Galls of *Contarinia* sp. 1 appeared in early May on lateral veins of the lower surface of expanding leaves. They are bladderlike, about 2–5 mm long, and pinkish. Yellowish-green to red, pealike galls of *C.* sp. 2 were found in early June on or near the midrib of the upper surface. Whitish, globose inflorescence galls of *C.* sp. 3 appeared in late May to early June.

Hymenoptera.—Another seed predator, the torymid *Megastigmus gahani* Milliron, was present on ninebark in New York and Pennsylvania. Adults, like those of the lepidopteran seed predator, appeared on the plants when flower buds were still closed or just beginning to open (late May) and were present until late June or early July. *M. gahani* is known to infest seeds of ninebark and to co-exist with the related *M. physocarpi* Crosby (Milliron, 1949). In our survey a single adult of *M. physocarpi* was taken on ninebark at Ludlowville.

The fauna of *Physocarpus opulifolius* encompasses at least ten specialist herbivores (restricted to ninebark or feeding on other members of the Spiraeoideae), including the aphids *Utamphorophora humboldti* and *Aphis neilliae*, for which ninebark appears to be the primary host in the eastern U.S. When specific identifications and further biological data are obtained, five additional specialists, or at least species preferring ninebark, may be added: the cicadellid *Penthimia americana*, the buprestid *Dicerca pugionata*, the thyatirid *Habrosyne gloriosa*, an unidentified species of *Olethreutes*, and a cochylid seed predator identified as *Aethes* sp. The cecidomyiids whose feeding induced leaf and inflorescence galls also may represent host-restricted species.

Four oligophagous species associated with other rosaceous hosts were collected: the apple red bug, *Heterocordylus malinus* Slingerland, which has not been re-

Table 3. Predacious insects associated with *Physocarpus opulifolius* in New York and Pennsylvania.

Species	Stages Collected*	No. of Collections		Prey Associations
		NY	PA	
Thysanoptera				
Phlaeothripidae				
<i>Haplothrips faurei</i> Hood	L, A	2 ^b	1 ^b	
<i>Leptothrips mali</i> (Fitch)	L, A	—	1 ^b	
Hemiptera-Heteroptera				
Pentatomidae				
<i>Podisus maculiventris</i> (Say)	E, N, A	3	3	<i>Calligrapha spiraeae</i> larvae
<i>P. placidus</i> Uhler	N, A	1	—	
<i>Stiretrus anchorago</i> (F.)	N	—	1	<i>C. spiraeae</i> larva
Phymatidae				
<i>Phymata</i> sp.	A	—	1	
Reduviidae				
<i>Pselliopus cinctus</i> (F.)	A	—	1	<i>Cantharis rectus</i> adult
<i>Zelus exsanguis</i> (Stal)	N, A	1	6	
Anthocoridae				
<i>Orius insidiosus</i> (Say)	N	1	2	
Miridae				
<i>Deraeocoris fasciolus</i> Knight	A	—	1	
Coleoptera				
Coccinellidae				
<i>Adalia bipunctata</i> (L.)	E, L, P, A	1	10	<i>Aphis neilliae</i> , <i>Utamphorophora humboldti</i>
<i>Anatis</i> sp.	A	—	1	
<i>Brachyacantha ursina</i> F.	A	—	1	
<i>Coccinella novempunctata</i> Herbst	L	—	1	
<i>C. septempunctata</i> L.	A	—	1	
<i>Coleomegilla maculata</i> (DeGeer)	A	2	1	in colony of <i>U. humboldti</i>
<i>Cycloneda munda</i> (Say)	(?L), A	—	5	in colony of <i>U. humboldti</i>
Neuroptera				
Hemerobiidae				
<i>Hemerobius humulinus</i> L.	L, A	—	1	
Diptera				
Syrphidae				
<i>Syrphus torvus</i> Osten Sacken	L	—	1	<i>U. humboldti</i>

* Stages collected: E, eggs; L, larvae; N, nymphs; P, pupae; A, adults.

^b Apparently common on *Physocarpus* but not always collected when observed and not all specimens collected were identified.

corded previously from ninebark; the tortricid *Olethreutes permundana*; and the geometrids *Lomographa semiclarata* and *L. vestaliata* (Guenée), which are known from *P. opulifolius* (Forbes, 1923; McGuffin, 1981). The aphid *Nearctaphis bakeri* (Cowan), whose primary hosts are various Rosaceae, has been recorded from *Physocarpus* in Pennsylvania (Pepper, 1965); we observed this species within

Table 4. Parasite species associated with *Physocarpus opulifolius* in New York and Pennsylvania.

Species	Host Associations/Stage Affected
Hymenoptera	
Braconidae	
<i>Apanteles schizurae</i> Ashmead	<i>Schizura unicornis</i> /larva
<i>Macrocentrus iridescens</i> French	<i>Choristoneura rosaceana</i> /larva
<i>Meteorus leviventris</i> (Wesmael)	<i>Eupsilia</i> sp./larva
<i>Meteorus</i> sp.	<i>Itame abruptata</i> /larva
<i>Microplitis</i> sp.	<i>Orthosia hibisci</i> /larva
<i>Perilitus coccinellae</i> (Schrank)	<i>Coleomegilla maculata</i> /adult
Aphidiidae	
<i>Lysiphlebus testaceipes</i> (Cresson)	<i>Aphis neilliae</i> /fundatrix
Ichneumonidae	
<i>Ischnus inquisitorius atricollaris</i> (Walsh)	<i>Choristoneura rosaceana</i> /larva
<i>Itoplectis conquisitor</i> (Say)	<i>Olethreutes permundana</i> /larva
Pteromalidae	
<i>Dibrachys cavus</i> (Walker)	<i>Choristoneura rosaceana</i> /larva
<i>Erixestus winnemana</i> Crawford	<i>Calligrapha spiraeae</i> /egg
Chalcididae	
<i>Spilochalcis</i> sp.	<i>Ancyliis spiraeifoliana</i> /larva
Eulophidae	
<i>Elachertus cacoeciae</i> Howard	<i>Olethreutes permundana</i> /larva
<i>Pediobius</i> sp.	Host unknown; emerged from colln. of seeds
<i>Tetrastichus</i> sp.	Host unknown; emerged from colln. of seeds

ninebark inflorescences, the typical feeding site on this host in Pennsylvania (J. O. Pepper, pers. comm.).

Even though several specialist herbivores and oligophagous species are associated with *P. opulifolius*, woody plants, compared to native forbs, tend to have a less specialized fauna (Messina and Root, 1980). Of the herbivores observed to develop on ninebark and identified to species, nearly 80% were generalists. At least two of the polyphagous herbivores have been recorded from *Physocarpus*: the coreid *Acanthocephala terminalis* (Dallas) (Yonke and Medler, 1969) and the tortricid *Choristoneura rosaceana* (Harris) (Schuh and Mote, 1948).

We note also that larvae and adults of a mycophagous coccinellid, *Psyllobora vigintimaculata* (Say), not listed in Table 1, were abundant on inflorescences covered with powdery mildew, *Sphaerotheca macularis* Wall ex Frier, during June at a site near Harrisburg. Sometimes common on *P. opulifolius* at Ludlowville were adults of the presumed mycophagous coleopterans *Corylophodes marginicollis* (LeConte) (Corylophidae) and *Tomarus pulchellus* LeConte (Cryptophagidae).

The most abundant of the nine species that fed as adults on vegetative structures of ninebark was the chrysomelid *Nodonota puncticollis* (Say). This species fed on expanding foliage at shoot apices and also on petals; mating pairs often were observed on the plants. Inflorescences of ninebark attracted adults of numerous beetles and flies. Table 2 records a portion of the species that appeared to obtain

nectar or pollen from *Physocarpus* flowers. In commenting on the attractiveness of ninebark inflorescences to insects, Stokes (1981) specifically mentioned the rose chafer, *Macrodactylus subspinosus* (F.), and cerambycids as flower visitors. Several species of andrenid bees are known to visit flowers of *P. opulifolius* (Laberge, 1973; Bouseman and Laberge, 1978; Hurd, 1979; Johnson, 1984). In Michigan, Waldbauer (1983) reported 14 syrphid species and (1984) 5 species of the syrphid genus *Temnostoma* from ninebark inflorescences.

The predacious insects occurring on ninebark and their associated prey are listed in Table 3. The aphid feeders *Adalia bipunctata* (L.) and *Cycloneda munda* (Say) generally were the most abundant predators encountered in sampling. Table 4 lists the parasitic species associated with insects collected on ninebark.

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